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WHERE ARE WE NOW AFTER DART?: AN ANALYSIS OF CURRENT STATUS OF PLANETARY DEFENSE TECHNOLOGIES AND POLICIES

Abstract

Compared to other global threats or natural disasters, asteroid impacts are among the few that humanity could prevent. However, doing so requires an efficient and reliable Planetary Defense infrastructure, which is unavailable today. Despite the low likelihood of a mass extinction event caused by an asteroid impact, even small objects that make it past our atmosphere, as experienced by the Tunguska asteroid or the Chelyabinsk meteor, could cause significant damage to the impact area and its surroundings, even resulting in loss of life.

In this context, Planetary Defense focuses on developing the space infrastructure that could allow us to identify and mitigate Near-Earth Objects (NEO) in a collision course with Earth. At the same time, Planetary Defense also addresses ways to reduce the consequences after impact when deflection is not an option. Last year, the NASA-led Double Asteroid Redirection Test or DART mission became the first ever Planetary Defense mission and the first spacecraft to successfully demonstrate the technical feasibility of changing the trajectory of an asteroid. However, this is only one of many demonstrations in a list of technologies needed to face different scenarios. Furthermore, handling a potential asteroid impact also requires policies that enable space and non-space entities to collaborate when addressing the situation. Consequently, it is crucial to continue pushing for investment and development of our planetary defense infrastructure to respond to such threats and see where these plans and strategies could help us improve how we respond to other high-impact, low-probability events.

This work intends to present a comprehensive assessment of our progress and direction concerning the development of our Planetary Defense Infrastructure and proposes a roadmap showing where our subsequent efforts should be made to continue making progress. This work will describe the current technologies and policies for planetary defense, both to prevent and react. In addition, the paper will address the external factors that also play a role in shaping such infrastructure, including economic, political, social, and others. As a result, this paper will provide a good overview of where we are and where we should go concerning planetary defense, considering the scientific and technical output of the DART and HERA missions and current planetary defense policies.

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